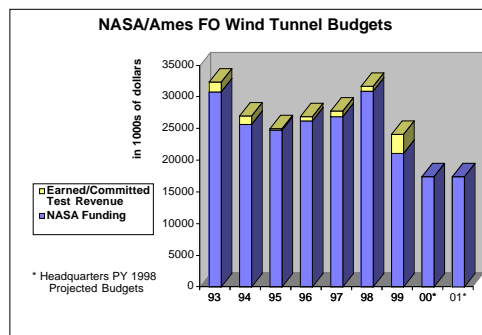


Wind Tunnels: A Profitable Enterprise?

Some Thoughts On Changing The Way We Do Business

by John Allmen

Obvious global and national economic changes are having a significant impact on our organizational health and well-being in wind tunnel operations. These changes are routinely confirmed in our discussions with customers, colleagues and competitors. The bottom line we are faced with is, "Can wind tunnel operations thrive without supplemental government money? And if not, how much government money should be spent to support wind tunnel operations and the aeronautics industry?"



NASA agrees that supplemental funding for minimum capability is currently required and is providing funding to maintain a presence in the industry. However, NASA Headquarters does continue to ask the tough questions that drive home the need for us to become very cost-effective in every task we do, from turning on the lights to delivering the final test data report.

We are faced with an interesting challenge. We are changing from a 'philanthropic' government wind tunnel testing organization to a more self-sufficient business of testing services. To compete efficiently as a business, what creative management and technical changes does our Division need to implement over the next few years?

(continued on page 3)

NFAC Integrated Systems Tests Draw To A Close

by Joe Sacco

The NFAC IST is nearly complete, wrapping up a construction effort that began in September of 1995. A tremendous amount of work has been done at the 40x80x120 wind tunnel complex during the last 3 years. The major focus of this effort was to create a more anechoic environment in the 40x80 test section. The walls of the test section were moved out to make room for a 42 inch-thick liner that will absorb model noise. The fan drive system was refurbished and modified to help reduce background noise, and the control systems for the fan drive and 40x80 and 80x120 model support systems were upgraded to improve efficiency. The fan blades were repaired during this down time.

NFAC personnel became very busy as project construction slowed and subsystem testing began. This critical transition went very smoothly because of good teamwork between code FO and project personnel.



new aeroacoustic test section of the 40x80 wind tunnel

(continued on next page)

**Inside: SHARC Test • Joint Safety Review • Employee Awards
FO Logo Contest Winner • Potluck And Cook-Off Pics**

NFAC IST Draws To A Close...

(continued from front page)

Validation testing of the facility control, drive, and 40x80 access systems progressed simultaneously with the re-installation of instrumentation and model utility control cables and preparations for the Integrated Systems Tests. Art Silva, Mike Simundich and a talented instrumentation crew worked many long hours to install and check out instrumentation suites for the fan blades, 80x120 IST, and 40x80 IST, all at the same time. Ninety newly-repaired fan blades were installed on schedule by the Calspan mechanics, lead by Dave Conoly and Charlie Brown. The complex procedures required to re-install the blades safely were developed by Al Lizak. The final sequence of subsystem testing confirmed that the blades on each fan motor had been installed and balanced correctly the first time.

The go-ahead to begin the 80x120 Integrated Systems Tests (IST) was received from the Center Director on May 27, 1998. On May 28 under the direction of Janet Beegle, the IST crew performed the first six-motor wind tunnel start in nearly two years. The 80x120 WT operating envelope was then gradually expanded until full-power runs were conducted from July 23 to July 30. The fan blade loads were carefully monitored during the envelope expansion, and Nhan Nguyen was able to verify that the loads at full power were below established redline limits.

The 80x120 IST was focused primarily on ensuring that the drive and facility control systems would work well together to support any type of upcoming test. Project engineers Mike Herrick, Reg King and Dave Lawrence, aided by a facility electrician team led by Tom Vahle and Larry Shuk, were key to the successful integration of the facility's drive and control systems. Steve Nance and Felton Smith were the primary wind tunnel mechanics in charge of making sure the 80x120 circuit was always ready to run.

Preparations for the 40x80 IST began as soon as the construction work ended, and continued concurrently with the 80x120 IST. Paul Askins, test manager in charge of the 40x80 IST, had a number of talented people helping with this effort. Art Silva and Bill Szychur made sure that all old, obsolete cabling was removed before re-installing new model instrumentation and control wiring—neatly organized and readily accessible for future modifications or

troubleshooting. Frank Pichay and Noel Tan from code JEE installed strain gages on the tunnel structure and fan blades. Instrumentation technicians Joe Paz and Paul Tumamao, and wind tunnel mechanics Mike Lopez, Ron York, and Ruben Torrecampo worked many long hours installing and testing IST instrumentation and test equipment.



crews installing acoustic wedges in deep liners in the 40x80 WT

On August 27, the IST crew completed the first 40x80 wind tunnel run in nearly three years. Runs at increasing velocities were made over the next few days, until the first full-power run was achieved on September 8. This run cleared the test section's structural envelope, and made the photos in building 221 crooked once again. Facility testing continued through October to establish baseline aerodynamic performance and calibrate the velocity measurement system.

The last two weeks of October were spent removing calibration hardware and installing the Subsonic High-Alpha Research Concept (SHARC) model [see page 4]. This model will be used initially to test the new 40x80 three-strut model support system controls. The IST will then be put on hold while we gather data for the Air Force with this model.

The IST will resume again in January when we remove the SHARC model and configure the test section for gathering wind-on acoustic performance data. The Operational Readiness Review Board will then recommend that NFAC be given full operational status when this acoustic test phase is complete and all remaining action items have been closed. Congratulations to all who made it possible.

NASA Wind Tunnel Sound Insulation Project Completed

Press Release

NASA has completed a \$33.8 million sound insulation project in the world's largest wind tunnel to help the U.S. aircraft industry design quieter engines and test advanced helicopters and other new aircraft.

During the refurbishing that began in September 1994, workers installed a dense acoustic lining in the National Full-Scale Aerodynamics Complex (NFAC) at NASA Ames Research Center, Moffett Field, CA. Project engineers said the acoustic modifications were needed to reduce the test section's background noise and echoes, both of which adversely affected the accuracy of sound measurement during jet engine tests.

"We now have an essentially anechoic wind tunnel test facility, which will allow us to conduct very accurate acoustic tests," said project manager Joe Hurlbut.

Workers installed insulation material and 1,600 acoustic panels in the floor, walls and ceiling of the wind tunnel's 40-foot-by-80-foot test section. The new custom-made metal gray panels are made of perforated sheet metal bonded to stainless steel mesh, similar to that used in automobile oil filters. The insulation material behind the panels is similar to the spun fiberglass commonly used to insulate houses. Panels measure about four square feet by 42" deep. The deeper the acoustic liner, the lower the sound frequency engineers can measure accurately.

"We needed to absorb the sound produced by the jet engines and helicopter rotors tested here in order to meet our research objectives," said Joe Sacco, the project's test and integration manager.

NASA engineers also upgraded the wind tunnel's control system to improve efficiency; and National Electric Co., Columbus, OH, modified the wind tunnel's main fan drive system to reduce noise. The Scott Company of San Leandro, CA, served as the project's primary contractor.

Further information online:
<http://ccf.arc.nasa.gov/je/jeu2.html>

Wind Tunnels: A Profitable Business?...

(continued from front page)

These and other questions point everyone's creative thinking to the formulation of appropriate solutions, and that is crucial. Our continued success and future in the testing services business depends on creative input from every individual.

The change away from a philanthropic model that supports the aeronautics industry with large amounts of research and development dollars has been forced by significant budget cuts, and a generally lower priority being put upon the aeronautics enterprise within NASA.

Operating as a business is somewhat of an oxymoron, because current laws prevent the government from actually making a profit. We can, however, develop a sustainment and investment program that will allow us to improve our testing services and achieve world-class capabilities in many more areas.

Though present laws allow us to be a 'break-even' business, there are two reasons why we at Ames perceive that wind tunnel testing can not be a wholly self-sufficient entity. The first is that various governments, mostly in Europe, are still subsidizing their wind tunnel operations to varying degrees, and in most cases we would have difficulty competing with their pricing when we charge full-cost.

The second is that in 'low demand years', there may not be enough revenue to support the minimum work force needed to operate our facilities. Presently, NASA wishes to be certain that the current R&D testing capability will remain available to the aeronautics industry even in low demand years. This decision requires a minimum level of funding to ensure that reasonable testing capability remains intact. We are concerned however, that this level of support may lose favor with NASA headquarters in the future. This further underscores our need, as an organization, to become more efficient, and by association, more capable of bringing in increased test revenue.

Management needs over the next few years are focusing on 4 key areas:

- Getting all of our facilities up and operating so they can once again service the community and bring in revenue
- Developing a new and wider customer base that is more likely to keep our facilities fully occupied
- Developing cost-effectiveness standards for all of our responsibilities, so that each staff member has a common understanding on how to accomplish tasks in the most economical manner and how to efficiently interact with each other and with our customers
- Cross-training our staff in several associated skills so they can be effective in a number of different work areas, i.e. enhance workforce flexibility

Many of you know that monumental efforts are being made by our staff members to make our facilities fully operational. Attention to clear goals and critical needs continues to be the responsibility of every one of us.

Management continues to focus on relieving the impact reduced funding has had on prioritized scope and capability. The dilemma that faces us is that there is no more money available to solve our problems. Your help in identifying those objectives that reduce schedule, cost and unacceptable risk are extremely important. Effective solutions to consistency or reliability problems that would delay or stop operations is key to our success. The discovery and implementation of actions or tasks that cost less than the needed benefit go a long way towards making us all more effective.

Marketing for a new and wider customer base is paramount to our survival. Dwindling government funding in major aeronautics programs, combined with our major facilities being shut down for extended periods for renovation, has sent customers seeking the 'best value' in wind tunnel test support. They have found it in a variety of facilities in Europe. To re-establish our customer base, we will have to exceed customers' new (and higher) economic expectations, as well as our proven track record for technical excellence.

The wider our customer base, the more stable our operations and the lower overall cost for each customer. There is a new focus to support any potential customer who would like to use our facilities as long as their use does not pose a safety concern. This opens up new and exciting areas for research.

The NFAC facility, for example, is entertaining a number of new opportunities. They include the automobile industry for acoustic testing, the racing industry for formula one cars, the building industry for testing structures, the amusement park industry for testing of roller coaster structures, and a host of other creative projects. The 12' Pressure Wind Tunnel is supporting America True, a boat which is one of the contenders for the America's Cup competition. Supporting this larger, more varied customer base means that we need to be effective in how we support a broader range of requirements.

The wider range of requirements and the economics of an efficient work force emphasizes the need to develop cost-efficient standards for all of our responsibilities. We need your input in maintaining what we do well now, and developing innovative ways to make improvements where it makes sense to do so. With standards in place, each individual has a common understanding of how to interact with all customers as well as each other. Staff members will be able to work efficiently with any of our customers and in any of our facilities, because they will have a common, shared basis for accomplishing tasks.

One example of cost-effective customer interfacing that can use some creative thinking is the area of wind tunnel data. We actually sell wind tunnel data (not just occupancy time) to customers, so they can use our data to make informed decisions.

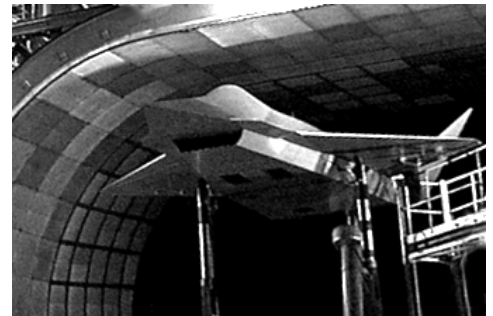
Focusing on the aeronautical or acoustic-engineering information the customer needs to solve their technical problems can have a profound impact on designing a run schedule to maximize effective data-gathering and reduce tunnel occupancy time.

(continued on page 5)

Killer SHARC On The Prowl At NFAC

by Paul Askins

No, it's not a typo, it's the Subsonic High-Alpha Research Concept model, back in the NFAC's 40x80 test section for another test. The SHARC model is a 55% scale advanced concept fighter model, originally built at Ames and tested in the 40x80 WT in 1994. Funded by the US Air Force Research Laboratory at Wright-Patterson, the SHARC model was designed as a test bed for a variety of high lift and maneuverability enhancement devices for next-generation fighter and attack aircraft. Looking something like a cross between the YF-23 and F-117 fighters, the model features hydraulically adjustable V-tails, leading and trailing edge wing flaps, a flow-through ejector-powered engine nacelle, and forebody and wing flap pneumatics. Capable of attack angles up to 45°, the model has been tested twice previously, validating a variety of lift and control improvement strategies including control surface pneumatic enhancement and forebody vortex control techniques.



SHARC model in the 40x80 WT

This test entry is an aerodynamic performance validation of the lift and control improvements resulting from a Continuous Control Surface (CCS). The CCS was created via a technique known as Continuous Moldline Technology (CMT). Basically, CMT is a design method used to provide a flexible, seamless closure around the perimeter of a conventional control surface, in this case, a wing flap. CMT promises to provide improvements to lift and control, as well as giving low-observability benefits. The SHARC CMT test uses one trailing edge wing flap to test the relative merits of the CMT design versus that of a conventional flap. The test also utilizes upper surface blowing of the flap, by using high pressure air ducted through the model. The blown flap helps increase the maximum lift coefficient obtainable by the CMT configuration.

The special hardware and wing modifications for the CMT test were designed and fabricated right here at Ames, under the guidance of Air Force and Boeing personnel. Boeing has been sub-contracted by the Air Force to develop the CMT technique. Code FEE was responsible for the design and project management. Most of the new flap and wing hardware was fabricated and installed by the Code FM metal fabrication and model machine shops.

Test operations are being led by test manager Mario Perez, with Mike Lopez, Ron York, and Ruben Torrecampo as wind tunnel, high pressure air, and model operators. Instrumentation engineer Joseph Davud has coordinated the model instrumentation efforts, assisted by Alex Sheikman and Art Silva, along with instrumentation technicians Paul Tumamao and Joe Paz. Data system operations and software responsibilities are being handled by Mitch Roe, Rod David, and Precioso Gabrillo, along with much support from the entire N-PRIME development team. The test commenced operations immediately following the 40x80 Aeroacoustic IST on November 9th, and test runs will continue through January.

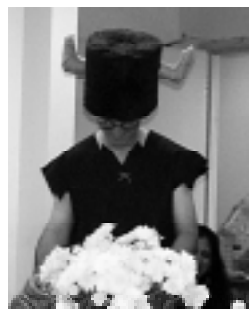
Halloween Potluck



Judy Galvez feels the bite



Chow Time!



Steve Ord does a fairly convincing Barney Rubble



this nice man offered to help slice my sandwich



cuteness overload



we were always kind of wondering what really happened to DB Cooper

Think Safety, Act Safely, and Communicate Safety

by Jerry Mullenburg and Phil Stich

One of the most important elements of our work here at NASA Ames is the enhancement of our safety culture. The centerpiece of our safety performance is our people. It is imperative that each of us understands and practices our role in maintaining a safe work environment and that we exercise sound judgment in every situation, at work and at home.

We operate and maintain very specialized and high-energy facilities, which have unique hazards. We recognize our responsibility to protect our staff and facilities while we execute our nationally important mission. The FO management team is committed to providing an environment that supports a strong safety culture in our Division. At our all-hands safety meeting on January 6, 1999, management described this commitment to safety, and outlined everyone's needed role in ensuring a safe FO work environment.



Krista Clapp,
*emphasizing a point
during FO Safety Day*

There are open lines of communication to identify safety deficiencies and suggestions for corrective actions and improvements. An FO Safety Board led by Tom Aiken provides means to communicate and implement safety initiatives. The Safety Board will address safety issues in a timely manner, and corrective actions and findings of the Board will be communicated to the FO staff through meeting minutes and other appropriate reports. The staff is encouraged to use this Board to improve the safety of our work environment. If you feel that safety deficiencies continue to persist, please communicate these items to higher management.

Your participation in the safety partnership is encouraged and needed. The FO management team pledges to work diligently to promote our safety culture, but we need your help and input. It's on all of us to think safety, act safely, and communicate safety.

Joint FO/Sverdrup Safety Program Review

by Scott Nikodym

During the month of January, representatives of FO and Sverdrup will perform a joint review of activities, processes, programs and conditions related to occupational safety, health and environmental compliance. The review will establish a baseline understanding of elements that are in place to promote a safe and healthful workplace; and protection of the environment, facilities and equipment. The collected baseline data will be compared to regulatory requirements, private industry standards, and best management practices as a means of identifying opportunities for improvement.

Review topics of special interest include accident data, safety inspection reports and related corrective measures, work area conditions and practices, system safety analyses and related corrective measures, employee training and certification, and employee comments and concerns.

The FO/Sverdrup management team encourages all those who are asked to participate in review activities to do so openly and candidly, so that the greatest possible benefits can be achieved.

A Profitable Business?...

(continued from page 3)

Reducing tunnel occupancy times while obtaining the same degree of information means that we can offer better value for our services.

Providing a better value for our services also relates to our work force in capability and flexibility in tunnel scheduling. Cross-training our staff, wherever possible, to work in several associated skill areas makes our work force much more versatile in providing a better value to our customers, and improves our staff capabilities in career growth. Wind tunnel scheduling is very unpredictable, causing us to look at alternatives for supporting our customers while maintaining our highly-skilled work force. Part of the total solution includes the concept of a flexible staff member that can ideally work in two or more associated skills, and if possible, in different facilities. A second solution to scheduling problems is detailing multi-skilled staff members to special projects, such as facility improvements.

These concepts are but a few of the elements people like yourselves have brought to the division. Your organization needs you to continue to come up with innovations and optimizations of every task for us to become the most effective wind tunnel testing service in the world.

We know that providing world-class testing services is achievable. We have been there in the past, and we have once again picked up the legacy. Our new challenge is to provide that capability at a cost that is competitive so our customers will consider us their first choice in wind tunnel testing support.

Is this all achievable? With all of us continuing to work as smartly as we are now, and with some innovative ideas to change the way we look at things in the future, the answer is an unequivocal "Yes". Our past has been a storied one that served the Nation well in different times. Our future is a dynamic and challenging one that will stretch every individual's thinking in new directions about the ways in which each of us performs our tasks and how we work together.

Outtakes From The 1st Annual Wind Tunnel Cook-Off



good eats, the great outdoors , what's not to like?



The three-legged race begins... and they're off!



when you crash on the three-legged course, you CRASH



this man is obviously up to no good



Armando Buenaventura, accepting the award for the victorious 12-Ft Pressure Cookers



the people responsible (l to r): Herb Finger, Pete Zell, Patricia Gregory, Steve Ord, John Allmen, Armando Buenaventura

FO Logo Contest Winner

As you may already know, the 'divorce' between Wind Tunnel Operations and the Sim Labs months ago, with the corresponding change in designation to code FO for our new division, left us without an official logo. To alleviate our 'logolessness', a Contest was held, as announced last issue, so that our new logo might be designed by an FO employee.

We recieved multiple design concepts, all of which were excellent, but ultimately we had to choose, and our winner is Pete Zell, NFAC Facility manager, whose design you may have noticed gracing the front page. Mr. Zell will recieve \$50 for his design idea.

Pete's FO logo design isn't final, and may be modified somewhat by a graphic artist, but the design concept will remain similar.

Honorable mention is also given to Steve Ord and Patricia Gregory, who submitted worthy designs of their own. A 'thank you' goes out to everyone who participated in helping FO gain an identity all its' own.



FO Outlook Editor: Lee Vieira

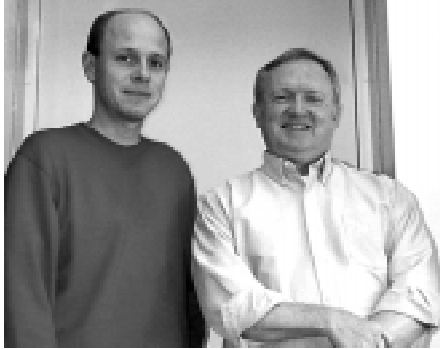
URL: aocentral.arc.nasa.gov/WhatsNew/Whats_new.html

phone: x4-5193

mail: lvieira@mail.arc.nasa.gov

Employee of the Month Awards

Alan Boone and Norbert Ulbrich Develop Superior WICS System



***Norbert Ulbrich (l)
Alan Boone***

Alan Boone received a Civil Servant of the Month Award for June and Norbert Ulbrich received a Contractor of the Month Award for June for their collaborative work on the WICS (Wall Interference Correction System).

WICS has reached a major milestone with the completion of the theory, code and measurement system for tests in the 12' PWT, including full-span, semi-span and powered lift testing. WICS is an Ames-unique, state-of-the-art system that replaces classical wall correction, and will eventually be merged into SDS/FCS for real-time corrections. Industry (Boeing LB and St. Louis) and other wind tunnel organizations (Langley, AEDC) have asked for the code and expressed great interest in its' future. Alan and Norbert presented a paper on WICS at the recent AIAA Aerospace Sciences in Reno, and received one of 4 awards for "outstanding paper".

Norbert developed the theory behind WICS and wrote the code while Alan has developed the measurement system that provides the data input to the theory. They have both been instrumental in evolving and improving the system. The documentation has been copywrited and a Space Act Agreement signed so that the codes and Theory Guide will be available for industry and other interested organizations.

Jim Ross and Larry Meyn Help Boeing 777 Test Get High Marks

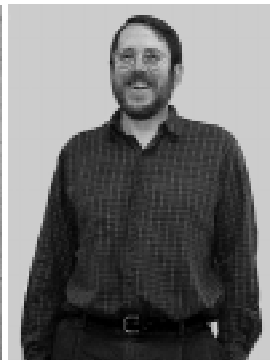
Jim Ross and Larry Meyn contributed significantly to identifying the cause of data anomalies in the Boeing 777 test, discovering that they related to the model configuration and not the facility or data system.

Jim and Larry's intense determination and knowledge of aerodynamics allowed them to analyze the data and advise Boeing representatives that the issue was with the model and the application of visual techniques, not with the facility. Their efforts contributed greatly to the high scores that Boeing gave the test.

Jim Ross and Larry Meyn are Civil Service Employees of the Month for May.



Larry Meyn



Jim Ross



Doug Atler

Doug Atler Recognized For UPWT Training Plan Contributions

Doug Atler receives a Contractor of the Month Award for September for developing and implementing a training plan for the Unitary Plan Wind Tunnel.

Doug surveyed the training which is required for UPWT operations and the training which had been put into place in the 12-Ft PWT, then developed an extended training plan for the UPWT. The UPWT training for the data acquisition system began in June, with the primary focus on Instrumentation Engineers and Instrumentation Technicians.

(Awards continued on page 8)

Employee of the Month Awards

SDS Validation & Training Team Cuts Software Downtime Dramatically



***Richard Millington (l)
Rob Hainer***

The previous release SDS (Standardized Data System) 2.0 was deployed to the 12 Ft PWT facility in the absence of a structured process for the TPS Calibration test. This resulted in SDS software downtime of over 20% of the total tunnel occupancy time. The High Wing Transport (HWT) test required additional SDS changes to support their program that would be contained in SDS 2.1. The operations and researchers indicated that the biggest risk to their HWT test was the reliability associated with the new SDS 2.1 release.

A cross-functional team of development and operations staff was created to perform the release validation testing and training associated with the new SDS 2.1 release. Several weeks of testing had documented over 20 software issues with the release. The critical problems were then corrected by the SDS developers prior to its' deployment. Training on the new release was also given to all of the HWT operations staff. This extensive, planned activity eliminated the historical increase in test downtime associated with new software releases.

Past the halfway point of the HWT test (76 shifts) the total SDS software downtime had equated to only 2.5% of the total occupancy hours. And only about a third of that downtime was directly related to the software release.

The SDS Validation and Training team is formally recognized for their efforts in increasing the SDS reliability through their several weeks of effort. The team consisted of Rob Hainer (SDS Release Validation Manager (Sterling)), Dan Loney (PSI systems (Calspan)), Roy Arakaki (Instrumentation Operations (SIMCO)), Adam Jackson (Software Operations (Sterling)), and Richard Millington (Training (Sterling)).

This mixed contractor team is awarded an FO Contractor Team of the Month award for September.



***(l to r): Roy Arakaki,
Adam Jackson, Dan Loney***

Scott Richey Key In UPWT Composite Blade Tests

Scott Richey is recognized for his work in completing the modal testing of the new composite blades to be installed in the UPWT.

Scott assembled the instrumentation team for the modal test, then proceeded with the impulse modal testing of the new composite rotor blades for the three-stage compressor which drives the 11x11 Foot wind tunnel. These blades are more structurally robust and damage tolerant, and will be installed in the three-stage compressor during the upcoming IST.

A Civil Service Employee of the Month Award for September goes to Scott Richey.



Scott Richey

(Awards continued on page 7)